

Key Digital®, led by digital video pioneer Mike Tsinberg, develops and manufactures high quality, cutting-edge technology solutions for virtually all applications where high quality video imaging is important. Key Digital® is at the forefront of the video industry for Home Theater Retailers, Custom Installers, System Integrators, Broadcasters, Manufacturers, and Consumers.

Key digital®

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KD-X400ProK

HDBaseT/HDMI via Single CAT5e/6 (Tx+Rx Set) Extenders, support Ultra HD/4K, EDID Control, Hot Plug Control, Full Buffer System, IR Sensor, Up/Down IR & RS-232

KD-X400POHK

Power over HDBaseT/HDMI via Single CAT5e/6 (Tx+Rx Set) Extenders, support Ultra HD/4K, EDID Control, Hot Plug Control, Full Buffer System, IR Sensor, Up/Down IR & RS-232

Operating Instructions



Key digital®

The Experts in Digital Video Technology and Solutions™

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**Ultra
HD/4K**



You MUST use the Power Supply provided with your unit or you VOID the Key Digital® Warranty and risk damage to your unit and associated equipment.



Please read all instructions to insure safe operation of the product.

About KD-X400ProK/KD-X400POHK

KD-X400ProK/KD-X400POHK HDBaseT/HDMI (Tx & Rx) Extenders extend 1080p/60, 1920x1200, 3D signals up to 250 ft. via single Key Digital® KD-CAT6STP1X Super CAT6A shielded cable, or up to 200 ft. using a single third-party CAT5e/6 cable. 4K/UHD 24/25/30/60 (4:2:0) signals are extended up to 150 ft. using Key Digital® KD-CAT6STP1X Super CAT6A Shielded cable, or up to 125 ft. using a single third-party CAT5e/6 cable. In addition to HDMI video and audio signals, KD-X400ProK/POHK carries IR and RS-232 for controlling remotely located equipment or the RS-232 port can be used to control the KD-X400ProK/POHK.

Key Features

- **HDBaseT via Single CAT5e/6 UTP/STP Extension:** With fully automatic adjustment of feedback, equalization, and amplification depending on cabling length
- **KD-X400POHK:** Features power extension from Tx to Rx with Power Over HDBaseT, Rx unit does not require power supply
- **Signal Extension:**
 - » Up to 150 ft. @ 4K/24/25/30/60 using KD-CAT6STP1X cabling
 - » Up to 125 ft. @ 4K/24/25/30/60 using third-party CAT5e/6 UTP/STP cabling
 - » Up to 250 ft. @ 1080p / 1920x1200 using KD-CAT6STP1X cabling
 - » Up to 200 ft. @ 1080p / 1920x1200 using third-party CAT5e/6 UTP/STP cabling
- **4K/Ultra HD:** Support for 4096x2160 or 3840x2160 24/25/30Hz at 4:4:4 or 60Hz at 4:2:0
- **EDID Control:** Internal library features 15 default EDID configurations and native EDID data from Output/Display devices connected via Rx
- **Hot Plug Detection Control:** Enables integrator to choose if active signal voltage is forced to connected input and output devices
- **Full Buffer System™:** Manages TMDS re-clocking / signal re-generation, HDCP authentication to source & display, and EDID Control handshake

- **IR Sensor:** Sensor powering via +5V on IR In ports collects line-of-sight IR from remote(s) without external IR connecting block
- **Up/Down IR:** Two channels of IR enable control to/from devices connected to Tx and Rx units
- **RS-232:** Bi-Directional control to/from Tx and Rx unit on DB9 connector
- **RS-232 Control Mode:** Provides control of Tx unit as well as connectivity status
- **3D:** Support for standard 3D stereoscopic signal formats
- **Deep Color Support:** 12bit Deep Color video / 8bit color for 4K/60.
- **Lossless compressed digital audio:** Support for Dolby® TrueHD, Dolby® Digital Plus and DTS-HD Master Audio™
- **CEC Support:** For inter-device control between main input and output HDMI channel
- **Daisy Chaining:** Connection of Tx and Rx units allows almost unlimited extension of HDMI, RS-232 and IR signals
- **HDMI® and HDCP Licensing:** Fully licensed and compatible with all HDMI and HDCP technologies
- **I2C Communication:** EDID and HDCP authentication to Display and Source
- **Power Supplies:** Included with screw-in type connectors
- **Control System Support:** Compatible with Compass Control®, AMX®, Control4®, Crestron®, KNX®, RTI®, Savant, URC®, Honeywell®, HAI®, Leviton® etc.

KD-X400ProK Accessories

- (2) 5V 2A DC Power Supplies (Screw-In Type), (2) Mounting Brackets,
- (3) Locking HDMI Cable Clips, (1) IR Emitter, (1) IR Sensor
- **KD-X400ProK requires power on both Tx and Rx units**

KD-X400POHK Accessories

- (1) 12V 2A DC Power Supply (Screw-In Type), (2) Mounting Brackets,
- (3) Locking HDMI Cable Clips, (1) IR Emitter, (1) IR Sensor
- **KD-X400POHK only requires power on the Tx unit, which extends power to the Rx unit**

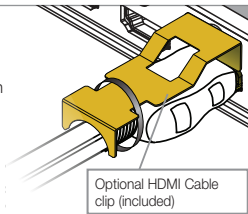
Quick Setup Guide

- Step 1:** Find a safe and convenient location to mount or place your KD-X400ProK/KD-X400POHK units
- Step 2:** Begin with the KD-X400ProK/KD-X400POHK Tx/Rx units and all input/output devices turned off with power cables removed
- Step 3:** Connect your HDMI source to the input port of your KD-X400ProK/KD-X400POHK Tx unit
- Step 4:** Connect your HDMI displays to the output port of your KD-X400ProK/KD-X400POHK Rx unit
- Step 5:** Connect KD-X400ProK/KD-X400POHK Tx unit to KD-X400ProK/KD-X400POHK Tx with CAT5e/6 cable
- Step 6:** Connect additional IR/RS-232 control connections and IR sensors
- Step 6:** Connect power to the KD-X400ProK/KD-X400POHK Tx units and KD-X400ProK Rx unit
- Step 7:** Power on input/output devices

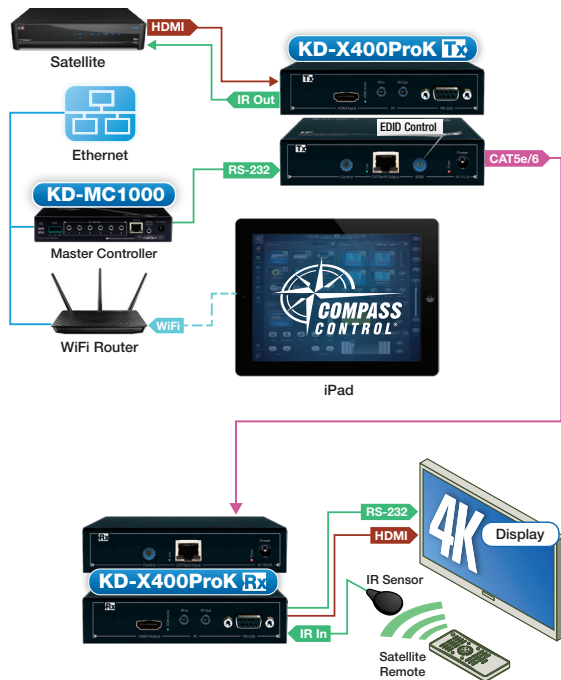
Installation and Operation

Before permanently securing the unit for final installation, test for proper operation of the unit and cables in your system. It is recommended that you leave enough ventilation space to provide sufficient airflow and cooling.

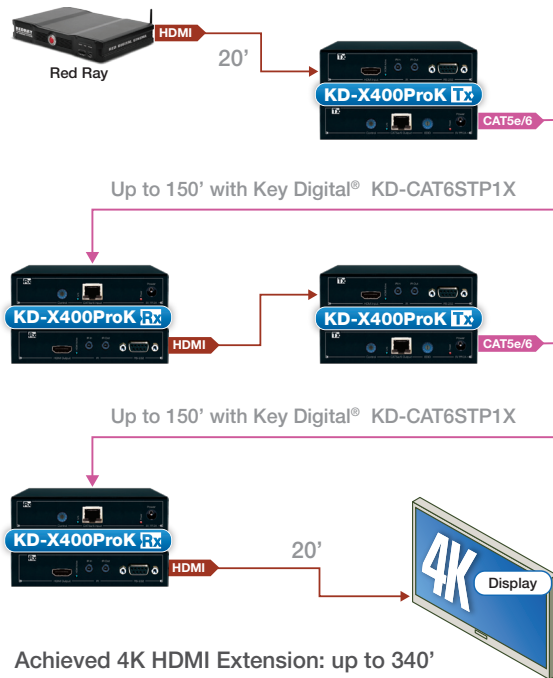
An optional HDMI cable clip (included) allows for a secure connection of HDMI cables to KD-X400ProK/KD-X400POHK units and helps prevent intermittent or complete signal loss due to poor connectivity.



Application Example



Daisy-Chaining Example



Connections

Before making any connections, power off your source and display devices.

Tx Unit:

- Using a short HDMI cable, connect your source device to the HDMI port labeled “HDMI Input”. To connect DVI or Display Port, use appropriate adapters.



- Connect the CAT6 STP cable that connects to the Rx Unit at the port labeled “CAT5e/6 Output”.



- Make IR In and Out connections to receive (IR In port) or send (IR Out port) control signals. Refer to the “Extending IR & RS-232 Control” for more information.



- Connect a DB9 cable for bi-directional RS-232 control. Refer to the “Extending IR & RS-232 Control” for more information.



Rx Unit:

- Using a short HDMI cable, connect your output / display device to the HDMI port labeled “HDMI Output”.



- Connect the CAT5e/6 cable at the port labeled “CAT5e/6 Input”.



- If you are sending or receiving IR, connect it at this time



- If you are transmitting or receiving RS-232, connect to the RS-232 port



- Connect power to the Tx and Rx using the included power supplies and then power up your source and display equipment.

Extending IR and RS-232 Control

RS-232:

Three different modes of usage are available, determined by the position of the Control Rotary.

→ RS-232 Pass-through Mode

- » Send and receive (bi-directional) RS-232 commands for controlling remote equipment.
- » Requires the use of a null-modem cable on one (either) side.

→ Control Mode

- » Provides control of Tx units as well as connectivity status
- » See RS-232 Commands section for more information

→ Firmware Upgrade Mode

- » Two different types of firmware may be updated: MCU (KD-X400ProK/KD-X400POHK units), and HDBaseT (extension over CAT5e/6)



Rotary Control Switch

| RS-232 Mode | Pin 2 | Pin 3 | Pin 5 | Control Rotary Position |
|--------------|-------|-------|--------|-------------------------|
| Pass-through | Tx | Rx | Ground | 0 – 7 |
| Control | Tx | Rx | Ground | 8, 9 |
| F/W MCU | Tx | Rx | Ground | A, B |
| F/W HDBaseT | Tx | Rx | Ground | C, D, E, F |

IR

→ Bi-directional IR control extension is supported.

- » "IR In" port on the Tx unit extends to the "IR Out" port of the Rx unit
- » "IR In" port on the Rx unit extends to the "IR Out" port of the Tx unit

→ **IR In:** IR In ports support two different modes, determined by the position of the Control Rotary.

» Serial IR:

- » A fixed 5V input signal with a 3.5mm mini jack
- » IR signal on the tip. Mono or stereo 3.5mm mini jacks are supported, with the ring having no contact.
- » Typically fed from a dedicated control system or an IR distribution block

» IR Sensor:

- » IR Sensors can be connected directly into IR In port, without the need for an external IR distribution block
- » IR signal on the Tip, with 5V powering of the IR sensor on the Ring.

| IR In | Tip | Ring | Sleeve | Control Rotary Position |
|-----------|-------|------|--------|-------------------------|
| Serial IR | IR In | N/C | Ground | 0-3, 8-B |
| IR Sensor | IR In | 5V | Ground | 4-7, C-F |

→ IR Out:

- » Pass-through from signal of corresponding IR In port
- » Driving power: 5V with 32mA minimum current
- » Typically connected with an IR emitter

| IR Out | Tip | Ring | Sleeve | Control Rotary Position |
|-----------|--------|------|--------|-------------------------|
| Serial IR | IR Out | N/C | Ground | Any |

- » The sleeve of the 3.5mm Male connector must have good physical contact with 3.5 mm Female input/output on the KD-X400ProK/KD-X400POHK.




Some 3.5mm Male plugs feature a plastic sleeve that extends longer than an average sleeve. This may cause poor grounding contact. See the example on the left.

Settings

EDID Control

EDID authentication is provided from the KD-X400ProK/KD-X400POHK Tx unit to the connected input / source device. The EDID file (AKA "handshake") is selected using the EDID Control rotary on the Tx unit and provides a list of compatible video and audio formats as well as digital data, informing the source device what it should output. Most sources will comply with a new EDID file without a power-cycle, but each source may behave differently. Adjustments may be necessary to help achieve desired video and audio formatting and may speed up sync time.

| | | | |
|---|-------------------------------|---|------------------------------|
| 0 | Copy EDID from CAT5e/6 Output | A | 4Kx2K@60, 2CH AUDIO |
| 1 | 1080i, 2CH AUDIO | B | 4Kx2K@60, DOLBY/DTS 5.1 |
| 2 | 1080i, DOLBY/DTS 5.1 | C | 4Kx2K@60, HD AUDIO |
| 3 | 1080i, HD AUDIO | D | 1280x720p@60 DVI (no audio) |
| 4 | 1080p, 2CH AUDIO | E | 1920x1080p@60 DVI (no audio) |
| 5 | 1080p, DOLBY/DTS 5.1 | F | 3840x2160p@30 DVI (no audio) |
| 6 | 1080p, HD AUDIO |  Rotary EDID Switch: | |
| 7 | 4Kx2K@30, 2CH AUDIO | | |
| 8 | 4Kx2K@30, DOLBY/DTS 5.1 | | |
| 9 | 4Kx2K@30, HD AUDIO | | |

IMPORTANT! Please apply light pressure to the EDID rotary when making your selection.

Control Rotary



The Control rotary enables the integrator to choose the desired setting for IR In ports, RS-232 Mode and Hot Plug Detection Control.

In many settings, the Control rotary setting may not match on the Tx and Rx units.

IMPORTANT! Please apply light pressure to the Control rotary when making your selection

Control Rotary Position Assignments:

| Position | IR In Mode | RS-232 Mode | Hot Plug Detection Control |
|----------|------------|--------------|----------------------------|
| 0 | Serial IR | Pass-through | Bypass |
| 1 | Serial IR | Pass-through | Bypass |
| 2 | Serial IR | Pass-through | Forced HPD ON |
| 3 | Serial IR | Pass-through | Forced HPD ON |
| 4 | IR Sensor | Pass-through | Bypass |
| 5 | IR Sensor | Pass-through | Bypass |
| 6 | IR Sensor | Pass-through | Forced HPD ON |
| 7 | IR Sensor | Pass-through | Forced HPD ON |
| 8 | Serial IR | Control Mode | Bypass |
| 9 | Serial IR | Control Mode | Bypass |

| Position | IR In Mode | RS-232 Mode | Hot Plug Detection Control |
|----------|------------|-------------------------|----------------------------|
| A | Serial IR | F/W upgrade for MCU | Forced HPD ON |
| B | Serial IR | F/W upgrade for MCU | Forced HPD ON |
| C | IR Sensor | F/W upgrade for HDBaseT | Bypass |
| D | IR Sensor | F/W upgrade for HDBaseT | Bypass |
| E | IR Sensor | F/W upgrade for HDBaseT | Forced HPD ON |
| F | IR Sensor | F/W upgrade for HDBaseT | Forced HPD ON |

Forced Hot Plug Detection (HPD)

Hot Plug Detection (HPD) may be forced on the Tx and/or Rx units in order to provide connected devices with necessary voltage to inform the device that a partner (source/display) is connected and active. If the Control rotary is set to any HPD Bypass setting, HPD signals from the output to the input device will pass as normal. In cases of many layers of connectivity, HPD may be lost leading to no signal at the display. In those cases, fix the Control rotary to any Forced HPD setting.

Range and Resolution:

Distance performance is significantly increased when using Key Digital KD-CAT6STP1X Super CAT6/STP Cabling.

- Up to 150 ft. @ 4K/24/25/30/60 using KD-CAT6STP1X cabling
- Up to 125 ft. @ 4K/24/25/30/60 using third-party CAT5e/6 UTP/STP cabling
- Up to 250 ft. @ 1080p / 1920x1200 using KD-CAT6STP1X cabling
- Up to 200 ft. @ 1080p / 1920x1200 using third-party CAT5e/6 UTP/STP cabling



NOTE: Use shielded metal RJ45 connectors with soldered ground wires when terminating shielded CAT5e/6. Key Digital part: KD-RJ45SC (compatible with KD-CAT6STP1X and other third-party CAT6/STP)

LED Indicator Lights

Power:

- » **Color: Red**
- » Solid illumination during power on state, as provided by healthy connection with power supply.

HDMI Active (HDMI Input/Output):

- » **Color: Blue**
- » Solid illumination during active link (voltage + data link) with connected HDMI input/output device
- » If Hot Plug Detection is forced to input or output device from Tx or Rx unit respectively, the HDMI Active light will illuminate solid regardless of HDMI signal from connected device.

CAT5e/6 Input/Output:

- » **Color: Blue**
- » Solid illumination during healthy linking to Rx unit and/or if HPD is forced at Rx unit.

RS-232 Commands

Connection protocol is as follows:

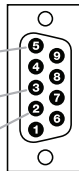
- Baud Rate = 57600 bits per second
- Data Bits = 8
- Stop Bits = 1
- Parity = None
- Flow Control = None
- Carriage Return: Required
- Line Feed: Required

RS-232 cable pin out

Pin 5 – Ground

Pin 3 – Receive

Pin 2 – Transmit



Commands are not case-sensitive. Spaces shown below may be excluded.
Carriage return and line feed is required at the end of each string.

Commands:

```
KD-X400ProK> H
-----
Key Digital Systems  HELP
-----
-- Azz      : All Commands may have Prefix System Address zz=[01-99] --
-- H        : Help
-- STA      : Global Status
-- SPCA xx  : Set System Address, xx = [00-99] (00=Single)
--
-- Video I/O Setup Commands:
-- SPO DBG ON/OFF : Set Output DGB ON/OFF
-- SPOC ON/OFF    : Set CAT5e/6 Output ON/OFF
-- SPC RSB Z      : Set RS232 Baud Rate to z bps, z=[0-4]
--                  [0:57600, 1:38400, 2:19200, 3:9600, 4:4800]
-----
```

Status:

```
KD-X400ProK> STA
-----
Key Digital Systems  STATUS
-----
-- KD-X400ProK      System Address : 00      F/W Version : 1.00 --
-- RS232 : Baud Rate=57600bps, Data=8bit, Parity=None, Stop=1bit --
-- Extension Mode : Standard
--
-- Video Input Status
-- EDID = 00, PWR5V = ON , Link = ON , HDCP = ON , video = HDMI
--
-- CAT5e/6 Video Output Status
-- DISP = SAM 2014, HPD = ON , HDCP = ON , DDC = GOOD, OUT = ON , HDMI--
-----
```

Specifications

Technical:

- Inputs Tx (Each): 1 HDMI, 1 IR In, 1 RS-232
- Outputs Tx (Each): 1 CAT5e/6 UTP/STP, 1 IR Out
- Inputs Rx (Each): 1 CAT5e/6 UTP/STP, 1 IR In
- Outputs Rx (Each): 1 HDMI, 1 IR Out, 1 RS-232
- DDC Signal (Data): Input DDC Signal: 5 Volts p-p (TTL)
- HDMI Video/Audio Signal: Input Video Signal: 1.2 Volts p-p
- HDMI Connector: Type A, 19 Pin Female
- RJ45 Connector: Shielded Link Connector, HDBaseT
- IR Connector: 3.5 mm monaural mini jack
- RS-232 Connector: D-Sub 9 Pin

General

- Regulation: CE, FCC, RoHS, WEEE
- Enclosure: Black Metal
- Product (Each): 6" x 4.1" x 1.2", Weight: 0.8 lbs
- Shipping Carton: 15.4" x 8.7" x 3.6", Weight: 4 lbs
- KD-X400ProK Power: 5V / 2A, 110-240 VAC, 50-60 Hz,
- KD-X400POHK Power: 12V / 2A, 110-240 VAC, 50-60 Hz
- Power Consumption: Tx - 2.5 Watts, Rx - 5 Watts
- KD-X400ProK Accessories: (2) 5V 2A DC Power Supplies (Screw-In Type), (2) Mounting Brackets, (3) Locking HDMI Cable Clips, (1) IR Emitter, (1) IR Sensor
- KD-X400POHK Accessories: (1) 12V 2A DC Power Supply (Screw-In Type), (2) Mounting Brackets, (3) Locking HDMI Cable Clips, (1) IR Emitter, (1) IR Sensor



Important Product Warnings:

1. Connect all cables before providing power to the unit.
2. Test for proper operation before securing unit behind walls or in hard to access spaces.
3. If installing the unit into wall or mounting bracket into sheet-rock, provide proper screw support with bolts or sheet-rock anchors.



Safety Instructions:

Please be sure to follow these instructions for safe operation of your unit.

1. Read and follow all instructions.
2. Heed all warnings.
3. Do not use this device near water.
4. Clean only with dry cloth.
5. Install in accordance with the manufacturer's instructions.
6. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
7. Only use attachments/accessories specified by the manufacturer.
8. Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way including:
 - » Damage to the power supply or power plug
 - » Exposure to rain or moisture



Power Supply Use:

You MUST use the Power Supply provided with your unit or you VOID the Key Digital® Warranty and risk damage to your unit and associated equipment.

How to Contact Key Digital®

System Design Group (SDG)

For system design questions please contact us at:

→ Phone: 914-667-9700

→ E-mail: sdg@keydigital.com

Customer Support

For customer support questions please contact us at:

→ Phone: 914-667-9700

→ E-mail: customersupport@keydigital.com

Technical Support

For technical questions about using Key Digital® products, please contact us at:

→ Phone: 914-667-9700

→ E-mail: tech@keydigital.com

Repairs and Warranty Service

Should your product require warranty service or repair, please obtain a Key Digital® Return Material Authorization (RMA) number by contacting us at:

→ Phone: 914-667-9700

→ E-mail: rma@keydigital.com

Feedback

Please email any comments/questions about the manual to:

→ E-mail: customersupport@keydigital.com



Warranty Information

All Key Digital® products are built to high manufacturing standards and should provide years of trouble-free operation. They are backed by a Key Digital Limited Lifetime Product Warranty Policy.

<http://www.keydigital.com/warranty.htm>

